

**REMARKS ON SOME PARASITIC NEMATODES FROM AUSTRALIA
AND NEW ZEALAND**

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During the past year several collections of nematodes have been submitted to us for examination. Amongst them were many from birds from Dunedin and Invercargill in southern New Zealand, the material having been forwarded to us by Miss Marion Fyfe, Zoology Department, University of Otago. H. McL. Gordon, of the MacMaster Veterinary Research Institute, Sydney, sent us oxyurids from a Fijian lizard, *Brachylophus faciatus*. Messrs. K. Sheard, of the C.S.I.R. Fisheries Laboratory, Cronulla, and A. Rau, of the South Australian Museum, forwarded viscera from some fish. Mr. J. M. Holtham, of Narrung, sent us specimens and information relating especially to worm infestation of fish in the lakes near the mouth of the Murray. Mr. G. G. Jaensch assisted us in regard to material from the Murray swamps at Tailem Bend. To all of these collaborators we express our thanks. The study was carried out in connection with the Commonwealth Research Grant to the University of Adelaide. Types of new species have been deposited in the South Australian Museum, Adelaide.

List of Hosts and Parasites mentioned in this Paper.

BIRDS

- PHALACROCORAX BREVIROSTRIS Gould — *Contracaecum spiculigerum* (Rud.)
Cosmocephalus jaenschi Johnston and Mawson, New Zealand.
- PHALACROCORAX CARBO L. — *Procamallanus murrayensis* Johnston and Mawson,
Tailem Bend, S.A. (probably ingested with its fish host).
- SULA SERRATOR Gray—*Contracaecum magnicollare* Johnston and Mawson;
Contracaecum sp. immature, New Zealand.
- NINOX NOVAESEELANDIAE Gmelin—*Heterakis gallinae* (Gmelin), probably ingested
with its avian host; *Capillaria strigis* n. sp., New Zealand.
- EUDYPTULA MINOR Forst.—*Contracaecum* sp. immat., New Zealand.
- EMBERIZA CITRINELLA Linn. — *Capillaria emberizae* Yamaguti, New Zealand
(introduced species).
- GYMNORHINA TIBICEN Latham—*Diplotrichaena clelandi* (Johnston), Burnett River,
Queensland.
- PELAGODROMA MARINA Lath.—*Scuratia marina* Johnston and Mawson, Bass Strait.

REPTILES

- BRACHYLOPHUS FASCIATUS—*Alaeuris brachylophi* n. sp., Fiji (via Sydney).

AMPHIBIA

- HYLA AUREA Lesson—*Spirohoura simpsoni* nom. nov., for *S. hylae* Johnston and
Simpson, N.S.W.

FISH

- GALAXIAS ATTENUATUS Jenyns—*Eustrongylides gadopsis* (larva). *Contracaecum*
sp. (larva), Lake Alexandrina, S.A.
- SALMO FARIO L.—*Eustrongylides gadopsis*, Murray Bridge, S.A.
- RETROPINNA SEMONI Weber—*Eustrongylides gadopsis*, Tailem Bend, S.A.
- AGONOSTOMUS FORSTERI Cuv. and Val.—*Eustrongylides gadopsis*, Lake Alexan-
drina and Tailem Bend.
- PLECTROPLITES AMBIGUUS Rich.—*Eustrongylides gadopsis*, Lake Alexandrina.
- THERAPON (BIDYANA) BIDYANA Mitchell—*Eustrongylides gadopsis*, Lake Alexan-
drina.
- SERIOLA GRANDIS Casteln.—*Capsularia marina* L., Rapid Bay, S.A.

- THREPTERIUS MACULOSUS Rich.—*Contracaecum legendrei* (larva), **Cucullanellus sheardi** n. sp., **Ascarophis australis** n. sp., Cape Borda, S.A.
 UPENEICHTHYS POROSUS Cur. and Val.—*Contracaecum legendrei* (larva), Port Lincoln, S.A.
 LEPIDOPUS CAUDATUS Euphr.—*Capsularia marina* L.; **Capillaria lepidopodis** n. sp., St. Vincent Gulf, S.A.

Alaeuris brachylophi n. sp.

Fig. 1-3

The following description is based on specimens forwarded to us for identification by Mr. H. Gordon of the McMaster Veterinary Research Laboratory, Sydney. They were taken from a lizard, *Brachylophus fasciatus*, from Fiji.

The males are 1.5 mm. – 3 mm. in length, the females 3.5–4.5 mm. The oesophagus is very long and thin, ending in a somewhat pyriform bulb, the entire organ being about half the body length in the male, and two-fifths in the female. The nerve ring is very near the anterior end, .2 mm. in the female; the excretory pore is just prebulbar in both sexes.

The spicule of the male is about .6 mm. long, very stout for the greater part of its length but tapering in the distal quarter to a fine point. The V-shaped gubernaculum is strongly chitinised. The caudal alae are wide and extend to the extremity of the tail. There are three pairs of perianal papillae, and one pair at the extreme tip of the tail.

The vulva in the female lies at about the middle of the body; the eggs are about 130–150 μ by 60–70 μ . The tail is .3 mm. long.

The species is placed in the genus *Alaeuris* because of the single spicule and the presence of gubernaculum and caudal alae. It differs from the four previously described species of this genus chiefly in the extent of the caudal alae and the size of the spicule.

HETERAKIS GALLINAE (Gmelin)

From *Ninox novaeseelandiae*, from Invercargill and Dunedin, New Zealand. The parasite has not previously been recorded from a bird of prey; it is more than probable that these specimens were accidentally ingested with the food of the host.

CONTRACAECUM MAGNICOLLARE Johnston and Mawson 1941

This species is now recorded from a gannet, *Sula serrator*, from Dunedin, New Zealand. It was originally taken from *Anous stolidus* from Queensland. In the original description the length of the spicules was inadvertently omitted; they are 1:3–3.6 of the body length.

CONTRACAECUM SPICULIGERUM (Rud.)

From *Phalacrocorax brevirostris* from Dunedin. As far as we are aware this species has not previously been recorded from this host, although it appears to be the common ascarid parasite of cormorants in many parts of the world.

In a previous communication we recorded it from cormorants on the subantarctic islands of New Zealand (Johnston and Mawson 1943).

CAPSULARIA MARINA L.

A larval worm apparently belonging to this species was taken from a kingfish, *Seriola grandis*, caught at Rapid Bay, and from *Lepidopus caudatus*, washed ashore at Glenelg, South Australia.

CONTRACAECUM (THYNNASCARIS) LEGENDREI Dollfus

Young stages of this worm were taken from the "silver spot", *Threpterus maculosus*, caught at Cape Borda; and from *Upeneichthys porosus* from Port Lincoln, South Australia.

CONTRACAECUM spp. (larvae)

1 Immature specimens of *Contracaecum*, probably ingested along with fish, were obtained from *Sula serrator* and *Eudiptula minor* from Dunedin. The arrangement of the lips resembled that of *Phocascaris* sp. and no doubt represented an immature stage before the typical condition present in *Contracaecum* had become established.

2 From *Galaxias attenuatus*, Lake Alexandrina. About twenty small worms obtained, all with three larval lips, but without larval tooth. Length, 8.4–10.5 mm.; breadth, 3.3–3.6 mm.; oesophagus one-tenth body length; oesophageal appendix: length of oesophagus = 1:1.3; length of intestinal caecum: oesophageal appendix = 1:1.6–1.8.

SEURATIA MARINA Johnston and Mawson

In the original description (1941) of this species from the small petrel, *Pelagodroma marina*, from Flinders Island, Bass Strait, the lengths given for the spicules are incorrect, due to an error in the position of the decimal points. They should read .14 and .24 mm. respectively.

COSMOCEPHALUS JAENSCHI Johnston and Mawson

A female was identified from *Phalacrocorax brevirostris* from Dunedin. The species was originally described (1941) from males from *P. carbo* from South Australia. Subsequently a female worm from *Pelecanus conspicillatus*, also from South Australia, was identified with the species, although its cervical papillae were bicuspid, while those of the male were tricuspid. In the present material, one female, the cervical papillae are bicuspid.

Ascarophis australis n. sp.

Fig. 4-5

A number of specimens of an apparently new species of *Ascarophis* were obtained from a "silver spot," *Threpterus maculosus*, caught by Mr. K. Sheard off Cape Borda, South Australia. The body of the female is swollen in the posterior third which contains the uteri; and this is especially marked in older females, which at first glance suggest members of the genus *Capillaria*. The males are 6–6.5 mm. long, the females up to 25.5 mm. long, 120 μ wide anteriorly, 200 μ wide posteriorly.

The head bears two large lip-like processes. The mouth leads into a long narrow cylindrical vestibule .15 mm. long, 50 μ wide (measured in the largest female.) The nerve ring surrounds the anterior end of the oesophagus and the excretory pore is shortly behind this. The narrower part of the oesophagus is .24 mm. in length in the female, and .17 mm. in the male; the wider posterior part 2.1 mm. in the female, 1.1 mm. in the male.

The ventral surface of the male for a short distance anterior to the cloaca is raised into several longitudinal rows of bosses. The caudal alae appear to be more or less symmetrical, but it was not possible to get a direct ventral view of the entire tail. There are three pairs of preanal papillae, the most anterior of them double-headed, the second and third close together, and six pairs of post-anal papillae arranged as in fig. 5. The spicules are .08 mm. and .28 mm. long; a gubernaculum is not present.

In the female the vulva is .64 mm. in front of the anus; the tail is .18 mm. long and ends in a knob. The eggs are more or less spherical, 36 μ in diameter and contain a coiled embryo.

The species appears closest to *A. morrhua* Beneden with which it agrees in the appearance of the head and vestibule, but it differs from that species in the position of the vulva.

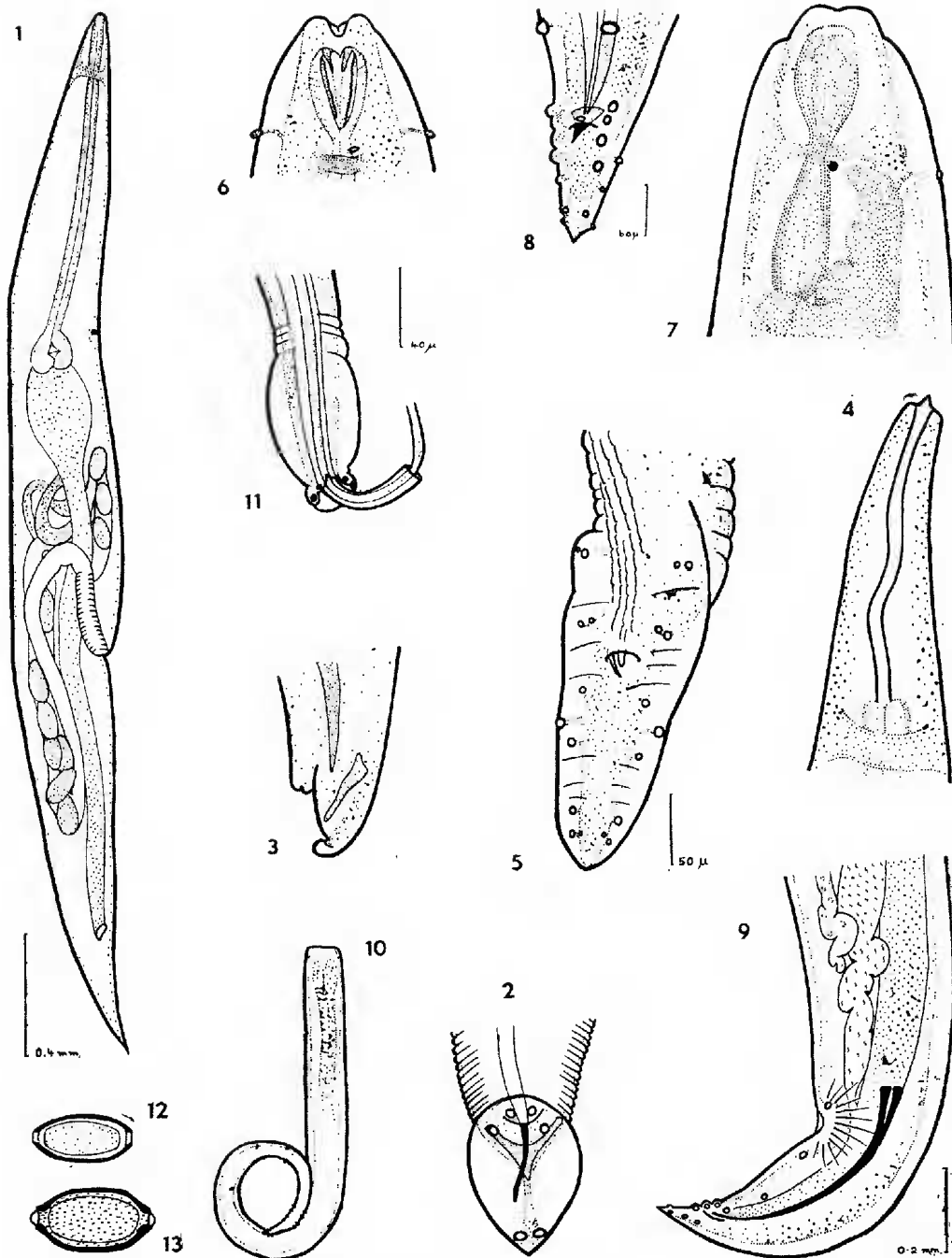


Fig. 1-3, *Alacuris brachylophi*—1, whole female worm; 2, ventral view of male tail; 3, lateral view of male tail. Fig. 4-5, *Ascarophis australis*—4, anterior end; 5, male tail. Fig. 6-10, *Cucullanellus sheardi*—6 and 7, lateral and ventral views of head; black spot on fig 7 marks position of cervical papilla; 8, tip of male tail in ventral view (young specimen); 9, male tail; 10, very young male. Fig. 11, *Capillaria emberizae*, ventral view of male tail. Fig. 12, *Capillaria strigis*, egg. Fig. 13, *Capillaria lepidopodis*, egg. Fig. 2, 3, and 5 to same scale; fig. 4, 11, 12, and 13 to same scale; fig. 6, 7, 9, and 10 to same scale.

PROCAMALLANUS MURRAYENSIS Johnston and Mawson

A male was collected from the cormorant, *Phalacrocorax carbo*, from Taillem Bend. It must have been ingested with its normal fish host. It was 9.2 mm. long, the male being recorded in the original account (1940) as 4 to 5 mm. in length.

Cucullanellus sheardi n. sp.

Fig. 6-10

From *Threpterus maculosus* from Cape Borda (coll. K. Sheard) and the Althorpe Islands (Adelaide fish market). Stout worms, tapering from the level of the base of the oesophagus backwards; the young forms, of which several are present, markedly nail-shaped, tapering from the truncated head end to a pointed tail (fig. 10). Males to 2.4 mm., females to 4 mm. Cuticle very thick. Oesophagus .64 mm. long in female, .52 mm. in male, greatly widened anteriorly and with a marked constriction at level of nerve ring. Intestinal caecum reaches to nerve ring. Excretory pore and cervical papillae at about level of nerve ring, .36 mm. from head in female and .22 mm. in the male. In the male, spicules .55 mm. long; 11 pairs of caudal papillae and sometimes one or two additional pairs anterior to the sucker; in young worms a single more or less dorsally-situated papilla observed more anteriorly still—shown in very young male in fig. 10. On the female tail are two large papillae situated at the beginning of the second half. Vulva 1 mm. from the tail. Eggs 63 μ x 39 μ .

The species is apparently very close to *C. fraseri* Baylis, from which it may be distinguished by the arrangement of caudal papillae in the male (the three adanal with one laterally from the first and another laterally from the third), by the more posterior position of the vulva, and by the relatively greater length of the spicules.

Spiroonoura simpsoni nom. nov.

Dr. H. A. Baylis, in a private communication, has kindly drawn our attention to the fact that *Spiroonoura hylae* Johnston and Simpson 1943 is a nom. praecoc., having been used by Reiber, Byrd and Parker, 1940, for a parasite from *Hyla* spp. We therefore suggest *S. simpsoni* as a new name for the species parasitic in *Hyla aurea* from Sydney.

DIPLOTRIAENA CLELANDI (Johnston 1912)

In 1912 *Filaria clelandi* was described by the senior author from a single male specimen. The type is not at present available, but from the drawings and description the species obviously belongs to the genus *Diplotriaena*. From the brief account given, it is impossible to say whether any of the *Diplotriaena* spp. since described are referable to *D. clelandi*; this point may be cleared up by the examination of further material from the type host, *Gymnorhina tibicen*. The specimen was collected at Eidsvold, Burnett River, Queensland.

EUSTRONGYLIDES GADOPSIS Johnston and Mawson

This long larval worm was first described (1940) from *Gadopsis marmoratus* from New South Wales and was recorded from a perch, probably *Plectroplites ambiguus*, from Northern Queensland. Baird's *Filaria sanguinea* from *Galaxias scribea* from the Murray, and Linstow's *Spiroptera bicolor* (1889) from *G. attenuatus* from the Adelaide district were also placed under it. *E. galaxias*, a larval form from *Galaxias olidus* from the vicinity of Adelaide was regarded as a distinct, but closely allied, form. We think it probable that *E. gadopsis* and *E. galaxias* are synonyms and represent the larval stage of *E. phalacrocoracis* Johnston and Mawson 1941, which was recorded from two species of cormorants, *Phalacrocorax melanoleucus*, and *P. carbo* in 1941, and later (1942) from *P. fuscescens*, all from South Australia. Our attempts to infect freshwater fish with eggs of *E. phalacrocoracis* have been unsuccessful.

Mr. J. M. Holtham, of Narrung, sent us larval material from the congolli, *Pseudaphritis urvillei*; callop, *Plectroplites ambiguus*; *Galaxias attenuatus*; and Murray bream, *Therapon bityana*; all from Lake Alexandrina. He also forwarded an adult from *Phalacrocorax melanoleucus* from the same locality. He informed us that the same species of larva occurred in the mullet, *Agonostomus forsteri*. Mr. E. Deed told us that he had observed the larva in the introduced trout, *Salmo fario*, in the vicinity of Murray Bridge. We have taken it from *Philypnodon grandiceps*, *Retropinna semoni*, and *Pseudaphritis urvillei* from the swamps at Tailem Bend.

In a larva forwarded by Mr. Holtham the six inner lips are well developed, each bearing a large conical papilla. Behind these is a ring of six rounded papillae. None was seen on the lateral lines. The buccal cavity measures .13 mm. long, and the oesophagus 12 mm. in length in a worm 102 mm. long. The specimens differed from those previously described by us in the shorter length of the buccal cavity and in the greater development of the lips whose condition was much more suggestive of that which we figured for the adult *Eustr. phalacrocoracis*.

In 1819 Rudolphi described *Filaria cystica* from a Brazilian freshwater fish, *Symbranchus laticaudus*. Leuckart (1876, 381) referred to Rudolphi's parasite and associated with the same species two worms collected from *Galaxias* by Schomburgk and identified previously as *F. cystica* by Schneider (1866), who considered the species to be the larval stage of *Eustrongylus gigas*. Leuckart figured a specimen from *Galaxias*, the worm being 75 mm. long and 0.6 mm. in maximum diameter, and considered the parasites to belong to the same species as Rudolphi's *F. cystica*, and to be larval stages of *Eustrongylus*. His remarks imply that Schomburgk's material came from Guiana. Cobbold (1879, 209) referred to *F. cystica* as being the young stage of *Eustrongylus gigas*. Shipley in the Cambridge Natural History (2, 1896, 142) mentioned *Galaxias scribe* and *Symbranchus laticaudatus* as hosts for *F. cystica*.

Baird's identification (1861) of the red worms from *Galaxias scribe* from the Murray as *Fil. sanguinea* Rud. has been mentioned by us in our account of *Eustrongylides gadopsis* (Johnston and Mawson 1940, 350), as also has Linstow's identification of material from *Galaxias attenuatus* (collected by Schomburgk in Adelaide, and housed in the Berlin Museum) as *Spiroptera bicolor*.

Leuckart's association of *Galaxias* with the name of Schomburgk and with Guiana as a locality may be explained by the fact that the latter botanist in 1840-42 accompanied his brother during the delimitation of the boundary of British Guiana, but R. Schomburgk came to South Australia in 1848 and was Director of the Adelaide Botanic Garden from 1866 to 1890—hence the locality mentioned by Linstow (1899, 17) for the material. *G. scribe* is a synonym of *G. attenuatus*. Gunther (Introduction to the Study of Fishes, 1880, 625) reported that the genus *Galaxias* occurred in New Zealand, Southern Australia, Tasmania and the extreme south of South America, hence Guiana can be excluded as a habitat for fishes of the genus. Miss Cram (1927, 368) was in error in quoting Rudolphi as recording *G. scribe* as a host for *Fil. cystica*. Jägerskiöld (1909) noted that the larvae from *G. scribe* resembled *Eustr. ignotus*, but we have not been able to consult his paper. Yamaguti (1941, 345) described larvae from a Japanese fish, *Rhinogobius similis*.

Available evidence has led us to believe that, for the present, the species occurring as larvae in Southern Australian freshwater and estuarine fish should be listed under *E. gadopsis*.

Capillaria strigis n. sp.

Fig. 12

From *Ninox novaeseelandiae*, Invercargill. One male specimen, 12 mm. long, with oesophagus 4.7 mm. long, width of body at head 11 μ , at base of oesophagus 54 μ , and at the widest part of the body 63 μ . The spicules are exceed-

ingly long, the distal ends, which are poorly chitinised, lying just posterior to the oesophagus. There is apparently no bursa-like structure, the posterior end being simply rounded.

CAPILLARIA EMBERIZAE Yamaguti

Fig. 11

Both males and females of a species of *Capillaria* were taken from *Emberiza citrinella* from Dunedin. Males about 13–13.5 mm. long, females to 14 mm. Ratio of oesophageal to post-oesophageal region = 1:2.4 in both sexes. Breadth across head $9\ \mu$ in the female, $8\ \mu$ in the male; at base of oesophagus $54\ \mu$ in female, $45\ \mu$ in male; at widest part of body $72\ \mu$ in female, $54\ \mu$ in male; across anal region $30\ \mu$ in female, $36\ \mu$ in male. Anus $16\ \mu$ from posterior end in female. Egg, $22\ \mu$ by $54\ \mu$. Cuticle at posterior end of male swollen to form two lateral "alae" $6\ \mu$ long, which at the extremity of the worm are constricted and give place to a small "bursa" containing two pairs of papillae. Spicule 1.26 mm. long; sheath not spinous.

The specimens differ from *Capillaria emberizae* Yamaguti 1941 from *Emberiza* spp. from Japan in the form of the bursa and the ratio of body parts in the female, but otherwise agree with it.

Capillaria lepidopodis n. sp.

Fig. 13

A single female worm, of which the posterior extremity is missing, was taken from *Lepidopus caudatus* from St. Vincent's Gulf. The worm is 25.2 mm. long, the oesophagus 7.1 mm. long, the rest of the body 18.1 mm. at least (worm much coiled and tip of tail missing), so that the ratio of anterior to posterior parts of body is about 1:3. The width at the head is $11\ \mu$, at base of oesophagus $54\ \mu$, at widest part $72\ \mu$. The vulva is a simple opening situated just behind oesophagus; the eggs are $30\ \mu$ x $60\ \mu$, their shells marked with fine irregular grooves.

According to the method of identification of *Capillaria* spp. from fish, devised by Heinze 1933, this species falls into the group in which females are longer than 10 mm.; this group comprises *C. gracilis* (Bellingh.), *C. fritschi* (Trav. 1914), and *C. pterophylli* Heinze 1933. Of these it is distinguished from *C. pterophylli* and *C. gracilis* by the shape of the egg, and from *C. fritschi* by the absence of papillae on the cuticle.

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